

Ground-Based Augmentation System



GBAS-RTK

precise positioning with integrity monitoring

Designed specifically for the maritime sector, the Ground-Based Augmentation System (GBAS) with Integrity Monitoring module and purpose-built Reference Station Control Software (RSCS) provides the most straightforward means of establishing Real-Time Kinematic services. GBAS-RTK by NavSim was designed to meet accuracy, reliability and availability requirements set out in the IALA R.121 regulation.

Integrity.
Accuracy.
Continuity.
Availability.

FEATURES

Centimetre level accuracy
(+1ppm)

Up to 20 Nm of signal
coverage

Accuracy level: 99,97%

Continuity level: 99,97%

Availability level: 99,97%

Fully redundant VHF Data
Broadcast link

Multipath mitigation an-
tennas

Remote communication
and configuration

Hourly, daily, monthly
and annual performance
reports



Overview

NavSim's Ground-Based Augmentation system (GBAS) provides a cost-effective precision navigation solution to increase waterway capacity, decrease required safety domains for vessels and reduce weather-related delays. It also reduces operating costs for the harbour, the marine pilots and the vessel's operator.

By covering harbour and approach waters with very precise, high integrity digital navigation data, NavSim's GBAS provides unparalleled flexibility to marine pilots and vessels whilst increasing safety of navigation and manoeuvre efficiency in ways that were not possible with legacy instruments

One system. Many applications

In order to deliver best possible results maritime pilots, dredgers, construction workers, surveyors and other professionals who operate in coastal and harbour areas rely heavily on local positioning infrastructure. The NavSim GBAS with Integrity Monitoring combines high performance sensors for reliable and accurate differential Real-Time Kinematic (RTK) corrections to make the job of all skilled professionals more effective.

Full redundancy

To prevent service outages and data loss, each NavSim GBAS is fully redundant meaning that all crucial elements are duplicated. This includes primary reference station, secondary reference station, integrity monitoring unit as well as data transceivers, antennas, power supplies and server infrastructure. Whenever required we also can provide cloud-based solution for data storage, archive and processing.

Integrity monitoring

Our intelligent integrity monitoring algorithms are designed to detect changes or anomalies in satellite signal characteristics that could affect the accuracy of the position. Whenever the accuracy provided by the primary reference station falls below established limits, corrections from the secondary reference station are activated and broadcasted. Should the RTK differential signal be lost altogether, a warning signal is automatically transmitted to advise mariners that the service is unreliable and that they should use alternative correction system (e.g. DGPS) until the RTK system is restored.





GBAS - the next generation of precision navigation technology

- One GBAS-RTK station can cover all berthing docks and approach waterways. The laser-based infrastructure covers only one berthing place, requiring additional installations for complete coverage
- One GBAS can broadcast unlimited VHD Fata Broadcasts allowign multiple berthing / unberthing operations simultaneously
- GBAS is not affected by interferences and obstructions to which the legacy laser-based docking systems are susceptible
- GBAS offers enhanced accuracy, reliability and availability; it complies with the latest IALA and WMO regulations
- Integrity monitoring servers continuously monitor and asses distributed differentail corrections to ensure the integrity of broadcast information in a timely fashion

NavSim - a world leader in precision navigation systems

NavSim is a leading global provider of integrated marine solutions, portable pilots units, GBAS-RTK systems, marine assest monitoring systems for harbours, vessels, manufacturers, businesses, port authorities, navies, hydrological offices and general marine operations.

- Offering turnkey products and services for precision navigation
- Experienced in the development and installation of differential GNSS-RTK navigation and docking systems
- NavSim's fail-operational architecture with integrity monitoring, ensures maximum availability and continuity by supporting continued operations even in the presence of one or more functional failures
- Dual redundant VHF data broadcast link, both transmitter and receiver assuring broadcast integrity
- NavSim, as a hardware and software company, develops in-house firmware and software layers for the hardware we manufacture. Such approach ensures fault-free integration and maximum efficiency of our products



FEATURES

Support for CMR, CMR+, RTCM 2.x and RTCM 3.x corrections

Support NTripCaster and NTripServer

Multi-constallation support (GPS, GLONASS, Galileo, BeiDou)

336 Channels per antenna for multi-constellation GNSS support

Triple GNSS frequency

Flexible RS-232, USB and Ethernet interfaces

Advanced RF Sepctrum Monitroing



Intelligent Port and Waterway Infrastructure



GNSS CHARACTERISTICS

- Position Antenna 336 Channel:
- GPS: Simultaneous L1 C/A, L2E, L2C, L5
- GLONASS: Simultaneous L1 C/A, L2 C/A
- BeiDou: B1, B2
- Galileo: Simultaneous L1 BOC, E5A, E5B
- SBAS: Simultaneous L1 C/A, L5
- QZSS: L1 C/A, L1 SAIF, L2C, L5
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Maximum output rate: 50 Hz
- Advanced RF Spectrum Monitoring and Analysis
- Proven low elevation tracking technology

REFERENCE OUTPUTS

- CMR, CMR+, sCMRx, RTCM 2.1, 2.2, 2.3, 3.0, 3.1, 3.2

PERFORMANCE CHARACTERISTICS

- Absolute Horizontal Accuracy: <100mm
- Projected Availability: >99.8% over 2 years
- Projected Continuity: >99.97% over 3 years
- Primary station to secondary station switching time: <1sec

INTEGRITY MONITORING

- On-site integrity monitoring
- Central integrity and monitoring server
- 24/7/365 performance characteristics monitoring
- Scheduled back-ups and archiving
- Dedicated integrity monitoring server software

PHYSICAL CHARACTERISTICS

Size: 1450x780 mm

Weight: 14.85 kg

POWER CHARACTERISTICS⁴

Power input: 230V AC

Power consumption: < 50W @230V

ENVIRONMENTAL CHARACTERISTICS

Operating temperature: -40° to +85°C (-40° to +185°F)

Storage temperature: -40° to +85°C (-40° to +185°F)

Humidity: 95% non-condensing

COMMUNICATION INTERFACES

- 1x LAN (Ethernet RJ-45)
- 1x USB 2.0
- 3x RS-232
- NTRIP Server

ORDERING INFORMATION

Module part number.....100-GBAS-RTK

Module.....NavSim GBAS-RTK

Notes

1) Accuracy and TTFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality. Position accuracy specifications are for horizontal positioning. Vertical error is typically < 2 times horizontal error.

2) Real range depends on the VHD Data Broadcast antenna height and type; range for VHF data transceivers may be affected by atmospheric conditions and signal multipath.

3) Real range depends on Base Station antenna height and type; range for VHF AtoN transponders may be affected by atmospheric conditions and signal multipath.

4) Power consumption for full system configuration.